DEPARTMENT OF COMMERCE
BUREAU OF FISHERIES
HUGH M. SMITH, Commissioner

FRESH-WATER TURTLES: A SOURCE OF MEAT SUPPLY

By H. WALTON CLARK
Scientific Assistant
AND
JOHN B. SOUTHALL
Shell Expert, U. S. Fisheries Biological Station, Fairport, Iowa

APPENDIX VII TO THE REPORT OF THE U. S. COMMISSIONER OF FISHERIES FOR 1919

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CONTENTS.

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By H. Walton Clark, *Scientific Assistant*, and John B. Southall, *Shell Expert, Fisheries Biological Station, Fairport, Iowa.*

INTRODUCTION.

Among the aquatic food resources of the United States to which but little attention has as yet been given are the several species of edible turtles and terrapins of the rivers and lakes. One species of turtle, the famous and much-sought-after diamond-back terrapin, has indeed long been utilized to the fullest extent consistent with the preservation of the species; and in recent years its propagation on privately controlled farms has been inaugurated. The green turtle of the sea has also for a long time been so generally esteemed and extensively fished as to have been brought into actual danger of extinction. It is worthy of note that, while these two species have been regarded as delicacies of a high order, their relatives of the interior waters have been comparatively little utilized, at least under their proper names. It seems quite probable, however, that certain species of fresh-water terrapin have been rather widely used as an illegitimate substitute for the diamond-back terrapin. Within the last year or two a more general interest in the subject of the use of fresh-water turtles as food appears to have developed, and the Bureau has received many inquiries for information in regard to methods of capture of turtles and the preparation of their meat for the table. It is the aim of the present paper to supply answers to these inquiries, so far as the information is at present available. The data herein presented have been secured by the authors through correspondence with dealers in turtles and by personal visits to many markets in the larger and smaller cities of the Middle West and to various points of commercial fishery, principally on the Mississippi and Illinois Rivers.

THE SNAPPING TURTLE.

DISTRIBUTION AND HABITS.

Commercially speaking, by far the most important species of the Mississippi Basin is the snapping turtle, *Chelydra serpentina* (Linnæus) (Pls. I and II), known also in different localities and under different conditions as the snapper, mud turtle, and mossback. Its position in the market and in the consciousness of the people, the methods of its capture, and the like, are so closely bound up with its natural history that, in order to properly estimate its economic status, it is necessary to give in some detail the main facts regarding its habitat and habits.

In the first place, it has a broad geographic distribution, its range extending from Nova Scotia to the Equator and westward to the Rocky Mountains. It is, therefore, one of the most widely known of turtles; and the New Englander who has migrated to the banks of the Wabash, the Ohio, or the Mississippi, or to the prairies of Illinois, recognizes it at once as an old acquaintance. This wideness of distribution indicates a hardiness and an ability to live under greatly varying conditions.

Not less important than its wide geographic distribution is its varied habitat. It is found in a great many different situations—in lakes, ponds, rivers, creeks, marshes, and bogs, and often travels overland a considerable distance from water. Only those familiar with the faunas of woodland ponds know the pretty, speckled tortoise; only the travelers along shaded creeks know Blanding's turtle; and to those who dwell afar from the larger lakes and rivers the soft-shell is known, if at all, only through the medium of books or museums. There are few, however, to whom the snapping turtle is a complete stranger.

In addition to its great variety of habitat, the leisurely habits of the snapper make it familiar. When approached it does not beat a hasty retreat, as do most other animals, but holds its ground against all comers. Many who are fairly familiar with the pond turtles and terrapin know them principally as a sudden splash from a log, and many who visit the sand bars where the soft-shells love to bask know them principally as a streak over the sand, as a splash at the water surface, and as a wake like that made by a big fish. The snapper, however, is the living embodiment of the status quo. He is willing to wait for the closest and most scrutinizing inspection; and, closely gazed upon, his appearance may have much to do with his being used as an article of food. One could not exactly call him handsome; a better statement would be that he looks good enough to eat. His corpulent, bulging body, projecting in rolls from his inadequate shell gives above all else the impression of meatiness. The rough skin, not greatly unlike that of a freshly plucked chicken, and the narrow cartilaginous bridge and small plastron all suggest easy preparation, much edible material, and little waste.

All the other details about this species—manner of capture, the peculiarities of the market, and, finally, the methods of cooking—are, as will be observed, closely connected with its life history and habits.

SEASONS AND METHODS OF CAPTURE.

During the summer the snappers are rather unsocial. They are solitary in habits, the individuals being widely scattered, so that it is difficult to take an accurate census of them. Because of these solitary summer habits, there is, generally speaking, very little fishing for this species in that season. There may, of course, be local exceptions; thus it was reported that throughout at least part of the summer of 1913, along the Grand River, Mich., there was an active turtle fishery, both snappers and soft-shells being caught in seines and shipped to the large near-by cities, such as Detroit and Chicago. In general, however, the summer is a dull season for turtles. One market man remarked that "the turtle is like the oyster, only in season when the

name of the months contains an 'r.'" Nearly all the other market men explained the situation by saying that "practically all the turtles are used for soups, and few people eat soups during hot weather." The situation is perhaps a little more complicated; it may have to do also with capture and storage. In summer occasional snappers are picked up while on their migrating trips; a few are now and then caught on set lines; and fishermen sometimes catch them in their seines or in baited hoop nets set for fish. It is doubtful whether any of these occasional summer-caught snappers get into the general market. The greater number are released, and a few are locally consumed.

During the autumn and early winter the snappers collect in considerable numbers and hibernate in suitable locations. In the vicinity of Muscatine, Iowa, it was stated that a favorite place for turtles to hibernate is in muskrat holes. According to report, as much as 5 tons of turtles have been taken from the various muskrat holes in one season. Our informant also stated that as many as 26 individuals have been found in one muskrat burrow, while at another time 1,420 pounds were obtained in one run. From 500 to 1,000 pounds of turtle were estimated as a recent catch for one day.

Along the sloughs of the Mississippi they congregate about and under old logs. A specific instance was cited of a fisherman who obtained 20 snappers, weighing from 10 to 20 pounds each, under a log in one of the sloughs of the Mississippi River.

Along the Illinois River, the Cedar River of Iowa, and, indeed, wherever there are springy places near large bodies of water, the snappers "mud up" for the winter.

It is from their hibernating places that the greater number of snappers found on the market are taken, and the captors are usually fishermen or trappers. The methods of capture employed for the various forms of winter quarters—whether muskrat holes, old logs, or springy places—are all, so far as could be learned, very much the same. The implement used is a stout hook, made by bending an iron rod at one end, sharpening the short or hook end, and leaving the other as it is or driving it into a wooden handle to make it better to manipulate during very cold weather. If there is much ice, it is cut and the hook probed or prodded about until a turtle, which feels much like a chunk of wood, is encountered. It is then pulled out by the hook. It is somewhat difficult to land large turtles, although they are benumbed and offer little resistance. The turtle catchers rely upon their hunting instinct to discover the turtles, and when a good place is found many can be taken from it, as indicated in the account given above.

Activity in snapper catching may be stimulated or depressed by widely different circumstances. The general wage scale probably has little influence, since fishermen and trappers are as much attracted by the fascination of their calling as by its emoluments and are not likely to desert their profession for a better-paying job. A high price for pelts and furs may divert greater attention to trapping. One fisherman said that the existence of saloons greatly helped the turtle market, as they dealt extensively in turtle soup. Under favorable conditions the turtle catcher can make very fair wages and still sell the meat at a reasonable price. During the winter of 1918–19 a market man reported: "Turtle meat is the cheapest meat I can buy."

SHIPMENT AND STORAGE.

Generally speaking, the men who catch the turtles make no attempt to hold or store them but ship them to market as soon as they can collect a sufficient quantity.

The turtles are usually shipped in barrels with holes bored through the bottom and through the sides for ventilation and with burlap nailed over the top. In this condition, of course, the contents are not open for observation, and a thriving turtle fishery may be in active operation in a particular region unknown to the general public. Since barrels have become expensive, the catches are sometimes shipped in crates similar to those used for chickens.

Upon arrival at the larger markets the containers may simply be stored in a cool place, where the turtles will remain in hibernation, ready for disposal by wholesale or retail as the market demands. It is with the return of warm weather that the storage question becomes important.

A good many dealers do not attempt to hold turtles at all but pass them to the consumer as rapidly as possible. In the basement of a large wholesale market at Chicago, a cool moist situation, there is a large turtle pen, or, rather, a series of pens, which will hold about 2½ tons of the living animals. They do very well here until summer arives, when the loss is considerable. Here the snappers are washed off occasionally, but the problem of feeding them has not been satisfactorily solved.

It might do much toward stabilizing the market if the intermediate buyers along the rivers, in order to be ready for early fall delivery, would establish large pounds to retain the spring catch, as well as the occasional turtles taken during the summer. It was stated that there was formerly a storage pen at Clear Lake, Ill., where 25,000 or 30,000 turtles could be satisfactorily kept; but that in recent years, owing to changed stream conditions, together with the consequent diminution in abundance of the animals, the pen has been abandoned. At Grafton, Ill., a pound was observed which has been in existence about four years and which was originally designed to retain carp, as well as turtles and terrapin. It is located near the river and comprises a pond supplied by seepage from the river and by rainfall. The size of the pond varies, therefore, according to weather and stream conditions, but at the time observed its dimensions were about 207 by 135 feet. This pond, having banks of considerable steepness, occupies nearly the entire area of the pen. The walls are riprapped with stone and surmounted by a wire fence of 1-inch-square mesh. The pound was said to contain 4,000 or 5,000 terrapin and 2 tons of snappers. It was observed at Grafton, as elsewhere, that quantities of terrapin are always estimated by number, and snappers by weight. Two kinds of terrapin were distinguished; the river terrapin described as "rough," which proved upon examination to be *Graptemys lesueurii*, and the "pond terrapin," described as "striped," which proved to be *Pseudemys elegans*. The former was regarded as much superior to the latter. During the summer, according to information furnished the authors, the turtles had been fed on fishery waste and on hog lights, of which they appeared to be very fond. They were being shipped to the markets of Boston and Philadelphia.

SOURCES OF SUPPLY.

Dealers at Chicago mentioned their source of supply as the Central States—Wisconsin, Minnesota, Iowa, Indiana, South Dakota, and Michigan—although they also received snappers and terrapin from Kentucky. Specific localities mentioned were Winona, Minn., and Guttenburg and Muscatine, Iowa. At one time the Illinois River was an important source of supply during the winter, and parts of it, especially toward the mouth, continue to be so. Kofoid states:[a] "The Illinois River and its backwaters, under present conditions, contribute annually * * * 15,000 dozen turtles" (probably including both snappers and terrapin). During the progress of the investigation of the Upper Illinois in June, 1918, there was no fishing at all on account of the closed season on fishes and, naturally, no capture of turtles.

MARKET CONDITIONS AND PRICES.

The amount of turtles handled by the markets of the large cities does not, of course, indicate the quantity which is consumed locally. As stated above, the winter is by far the most active market season. However, along the rivers the turtles are eaten the year around, whenever they can be obtained, fried soft-shells being especially consumed during the summer. The wholesale market in Chicago previously referred to handles about 10,000 snappers a year, valued at $5,000. Its buyer thinks he could handle a ton a week. Another market handled 1 to 1½ tons a month. The snappers on the Chicago market range in weight from 5 to 25 pounds each. At Peoria they were said to reach a weight of 30 pounds, the average being 7 or 8 pounds. According to the census of 1908, the Mississippi River Basin produced 713,000 pounds of turtles and terrapin, with a value to the fishermen of $25,000.

In these days of uniform prices for standard commodities ,a striking feature of the turtle market is the variety of prices. A turtle catcher at Muscatine, Iowa, stated that he could get 5 cents a pound live weight or 10 cents a pound dressed at Davenport. He said there was more money selling them alive, as they dressed off more than half, and also the trouble of dressing them had to be considered. One dealer in Chicago sold in wholesale lots at 8 cents a pound and retailed at 10 cents. A buyer quoted them at 6 to 7 cents a pound live weight. At St. Louis it was said that "turtle meat is selling higher than ever before, it being now (June, 1918) about 18 cents; whereas it used to be from 12 to 15 cents a pound."

A published commercial price list (Chicago, 1918) quoted live snapping turtles, usually 10 cents per pound, falling to 9 cents for the week of June 8, to 14, and rising to 11 cents July 20 to 26, 1918, and turtle meat, strictly fresh, 16 to 17 cents, rising during the progress of the summer. In the early part of the season frozen turtle meat was listed at 15 cents.

Many of the points covered above regarding source of supply, prices, and amount handled can best be illustrated by quoting from

[a] Kofoid, C. A.: Plankton studies. IV. The plankton of the Illinois River, 1894–1899, p. 562. Bulletin, Illinois State Laboratory of Natural History, Vol. VI, 1901–1903, Art. II. Champaign.

a letter received June 4, 1918, from a fish company in La Crosse, Wis., which goes into the subject with unusual fullness of detail:

We receive turtles from all of the commercial fishermen of the Mississippi, no one in particular fishing for them especially, as usually they are caught in such small lots that the average fisherman does not make much of an effort to gather them up. Usually the price this last year has been from 3 to 4 cents, and, getting them in such small quantities, the fishermen figured not money enough in them to bother with them.

We also get quite a few from the Indians who are moving about up and down the river. The general selling price has been (Philadelphia) from 7 to 12 cents, the high price being in the extreme cold weather, and usually the wholesale price runs from 4½ cents f. o. b. shipping stations, and the average quotation from the wholesale houses in Chicago and other places is from 7 to 9 cents.

The following is the amount that we have handled since November, 1917, and conditions were such that we have had to carry quite a lot of this stock on hand, as we were unable to sell it at all times or very readily:

	Pounds.
November	13,166
December	2,551
January	1,689
February	90
March	1,496
April	5,206
May	5,411
Total	29,609

The demand has been diminishing from year to year. Ten years ago we used to handle them by the carloads and could always find a ready market in New York, whereas at present there is very little demand in New York; in fact, practically none.

The kind of turtle we are handling is what is known locally as the mud or snapping turtle. There is some demand for the soft-shell turtles, but not enough to warrant our handling them.

At Grafton, Ill., it was stated that Boston afforded the best market for terrapin and Philadelphia for snappers.

PROPORTION OF WASTE.

In the consideration of any article to be used for food the item of waste is an important feature, since this must be accounted for somewhere between the producer, or in this case the captor, and the consumer. The opinion of dealers differed somewhat as to the amount of waste in the snapping turtle. It varies considerably according to the manner of cleaning. One dealer thought the turtles would dress off more than half, large ones dressing off less than small ones. Another thought a 12-pound turtle would dress off to 6 pounds, and a 5-pound one to 3 pounds. A dealer at Fort Madison, Iowa, said that by discarding the shell they would dress off two-thirds, but that the shell could be used in making soup, serving as a soup bone. One dealer added that "in making soup the liver and eggs are used, so there is not so much waste." In the Washington market some snappers were seen dressed for sale. The epidermis having been scalded off, and the scutes or epidermal plates of the shell removed, the remaining portion presented a very attractive appearance. Along the backbone of the turtle is a considerable mass of flesh known as "tenderloin," which in rapid or "shop" cleaning is discarded with the shell, but in careful cleaning is saved, thus reducing the waste. At Pekin, Ill., where turtles were cleaned rapidly, discarding tenderloin, liver, and eggs, as well as shell, a 14-pound

snapper furnished 6 pounds of meat. At Fairport, Iowa, one which weighed 11 pounds produced 5½ pounds of meat when carefully dressed, with tenderloin saved, but shell, liver, etc., discarded. The relatively small difference in market prices between live turtles and turtle meat among practiced dressers and dealers (10 cents alive, 17 cents dressed) does not account for so much waste, since one must also consider the labor of dressing the meat.

In considering the subject of waste it may be of interest to compare turtles with other familiar objects, such as fish and poultry, which may be bought either whole or dressed to suit the wishes of the buyer. The proprietors of some of the fish markets on the Mississippi (Muscatine, Iowa, and New Boston Ill.) and on the Illinois (Peoria), who have much experience weighing fish, since they buy them living from the fishermen and sell most of them dressed, were consulted in this regard, and their reports agreed very closely. Carp were reported to dress off about 30 per cent, or from 30 to 40 or 45 per cent, the higher percentages applying to the females full of roe, which is usually discarded. Buffalofish were reported to dress off somewhat less than carp. Catfish differ greatly, according to kind and condition, but dress off on the average 60 pounds to the 100. At the Fairport biological station two ripe male carp weighting 5 pounds 8 ounces were dressed. The head, scales, and entrails weighed 1 pound 3 ounces and the milt 8 ounces, leaving the weight of the dressed fish 3 pounds 12 ounces, a waste of 31.8 per cent. In looking through publications at hand devoted to poultry, under the subject of waste, cocks were reported to dress off 23.4 per cent, cockerels 26 per cent, hens 24.2 per cent, and pullets 25.8 per cent of the live weight. These wastes, of course, leave bones out of consideration. For fuller estimates and comparisons of the absolute amount of wastes of various fishes the reader is referred to a publication by Dr. W. O. Atwater, published as an appendix to the report of the United States Commissioner of Fisheries for 1880.[a] Unfortunately our data on the flesh of turtles are not in such a condition that they can be compared with the fish discussed in that article.

To one who has not watched the process it might appear that turtles would be difficult to dress. There is not nearly the labor involved in cleaning a snapper, however, that there is in plucking and dressing a chicken, and a novice would acquire the knack even more quickly with the reptile than with the fowl. The bones and joints are not so thoroughly ossified in the turtle and offer less resistance to the carver. Along with economical considerations it may be mentioned that one dealer remarked that "8 pounds of turtle will make soup for 50 people." Another phase of the subject which has to do with economy, but which is more closely related to the subject of cooking, will be discussed in that connection.

QUALITY OF FLESH.

The value of turtle flesh as a food and the extent to which it can be used as a substitute for other meats is a question to be solved

[a] Atwater, W. O.: Report of progress of an investigation of the chemical composition and economic values of the fish and invertebrates used for food. Appendix D, Report of the Commissioner, U. S. Commission of Fish and Fisheries, for 1880, pp. 231–286. Washington.

by nutrition experts, by chemists who can compute its value in terms of calories, carbohydrates, proteins, digestibility, etc., and by experiments with "diet squads." This is fundamentally the most important question. Certain it is that the white and the deep-red, dressed meat as displayed in the fish markets is very attractive in appearance.

Scarcely less important, however, is the question of its gustatory qualities; for whatever gives zest to our necessary foods is by no means to be despised. References in literature to the relative merits of different species of turtle are rather few. Nash[a] says of the common soft-shelled turtle (*Amyda spinifera*): "The flesh of this turtle is considered a delicacy;" and of the snappers: "Their flesh is considered good and in some localities they are much sought after for making into soup."

The flavor of the snapper, like that of other sorts of game or meat, varies somewhat according to the habits of the individual animal and according to the method of preparation. Perhaps the best method of approach to this phase of the subject is a consideration of the habits of the turtle.

The snapper is very voracious, feeding on frogs, fishes, crayfish, young water birds, etc. It has been accused of catching and eating young ducks. Those examined at Lake Maxinkuckee, Ind., had been eating snails (*Vivipara contectoides*), and seven individuals examined at the Pekin (Ill.) market, caught at Fort Madison, Iowa, in June, 1918, contained solid masses of mud. Two had fragments of crayfish in the mud, one a piece of wood, and another the bones of a frog. A large one caught at Fairport, Iowa, a good deal earlier in the season had its stomach practically empty.

In the summer the snappers may be caught far from water, in grassy places, or in mudholes and puddles, and those caught in one place would doubtless differ in flavor from those caught in another. The turtle from the mud puddle would taste differently from the one caught on the grassy sward, just as beef from cattle and milk from cows grazing in a garlicky meadow differ from the products of a blue-grass pasture; just as the canvasback duck well fed on wild celery is the delight of epicures, while the same species feeding on the fetid Chara is as distasteful as any coot and the celery-fed coot excellent eating, and as a carp from a warm, muddy puddle is soft and rank, while one from a cool clear stream or pond is firm and excellent. Doubtless, the hibernating turtles taken from their winter quarters have approached a uniformity of flavor.

Still, taking the snapper by and large, it is sufficient to say that it has been exceedingly difficult to find, either spoken or printed, any words of disparagement. At Lake Maxinkuckee, it is true, the opinion was expressed that old snappers have a rank flavor and are tough; but the animals were there taken in summer from the beds of fetid Chara, which, when fed upon, will give even the choicest waterfowl a rank flavor. In addition to this, they naturally haunted the muddier parts of the lake, and, as has been said, subsisted on snails. Also, the delicious soft-shells were very abundant in that region, and the snapper would naturally suffer by comparison. In

[a] Nash, C. W.: Manual of the vertebrates of Ontario. Published by Dept. of Education, Toronto. 1908.

most other places the snapper met with praise on every hand. Many had eaten no other kind of turtle but snapper, and it was liked in a great variety of ways.

In many respects, indeed, the eating of turtles may be well compared to the consumption of mushrooms. They are looked upon as a viand rather than as a food. Unknown or untried kinds are regarded with suspicion. The flesh of the box turtle is reported on pretty good authority to be unwholesome, and one man along the Mississippi asserted, but probably without reliable evidence, that "the striped turtles are poisonous." The general use of the snapper is much like that of the morel, or sponge mushroom. Persons who eat turtle at all eat this particular kind because they know it and are not so certain about the others. Those who had had experience with various sorts of turtles would always compare the snapper with other species. Some, but rather few, and these usually people fond of a pronounced gamy flavor, liked the snapper best. One man interviewed said: "The meat of the snapper is more like beef, while that of the soft-shell is more like chicken." An almost universal opinion was that the snapper contains several kinds of meat. One man said it contains 6 or 7 kinds; another, 7 to 9 kinds; and still another, 14 kinds.

The living snapper has a somewhat musky odor, but this may disappear or be diluted to a pleasant aroma by cooking, since no one complained of it. The meat of old snappers is said to be rather tough. One man said it was rendered stringy by cooking too long, and in making soup should be cooked only until the flesh left the bones. It may, indeed, be these two qualities—gaminess and toughness—that have made the snapper preeminently a soup turtle. Persons who discussed the matter of turtle soups asserted that "all turtle soups are really vegetable soups in which turtle takes the place of other kinds of meat." Some of these soups are highly spiced and flavored. One dealer reported that "restaurants are the only extensive users of turtles, and the snapper is used only for soup, which is not in much demand during hot weather." In the markets of the large cities there is little or no family buying of turtles, and the citizen who is accustomed to buying live chickens and either having them delivered or carrying them home would not think of doing the same with a snapper. Even the dressed meat is rarely bought for individual or family use. In the small river towns, however, there is more individual buying and a greater number of methods of cooking are in vogue. In one instance, at Pekin, Ill., when a half barrel of snappers, 10 in number, was received, 7 were immediately dressed for local sale. Usually, however, the people prefer soft-shells when they can get them.

THE ALLIGATOR SNAPPER.

The alligator snapper, *Macrochelys temminckii* (Harlan), which is found principally in the southern part of the United States, is similar in general habits to its smaller and more northern relative, the common snapper. It is especially abundant in the swamps of Louisiana, where an active fishery is carried on at certain seasons. It reaches an immense size, examples weighing as much as 219

pounds having been reported. Its sale is confined chiefly to southern markets. As it is too large to ship in barrels, it is prepared for shipment by drilling holes with a breast drill through the edge of the upper and lower shells on each side of the neck and feet, running wires through and fastening it so that the head and legs can not be protruded. The shell of one reported to have been taken at Hannibal, Mo., was seen by the senior author in St. Louis. The turtle was reported to have weighed 27 pounds.

THE FRESH-WATER TERRAPINS.

COMMERCIAL SIGNIFICANCE.

Within the Mississippi Basin the word "terrapin" is either a book name or a commercial term applied by market men to such of the hard-shelled turtles as find their way into the trade. Along the upper Mississippi and Illinois Rivers the only terrapin likely to be used is the Le Sueur terrapin, *Graptemys lesueurii* (Pls. III and IV). Along the upper Illinois a turtle, which from the description was supposed to be this, was referred to as the "Genetta." In the fish markets at Chicago lots of Le Sueur's terrapin and the elegant terrapin, *Pseudemys elegans* (Wied) (Pls. V and VI), were mixed together in barrels, no market distinction being made between them. Some of the *elegans* were said to be from Memphis, and they were called "Texas terrapin." In the turtle pen on the lower Illinois (Grafton) *elegans* was about as common as *lesueurii*, and was known as the "pond terrapin," the other species being the "river terrapin." At St. Louis the only terrapin seen at the opening of the turtle season in autumn was *elegans*. At Grafton *lesueurii* was the most highly esteemed of the two. Throughout the area under discussion there is another terrapin, the map turtle, *Graptemys geographica* (Le Sueur), so very similar to the Le Sueur terrapin that anyone but a specialist (and this includes both zoologist and fisherman) is likely to confuse them. The map turtle is probably as good as the others, but we saw none on the market. It apparently does not reach so large a size, however, and this may help explain its absence.

Exceedingly few terrapin are used even by the dwellers along the rivers, who are familiar with all sorts of aquatic food. This is probably due, not to their lack of excellence, but to the abundance and well-known qualities of the snappers and soft-shells, which have the additional advantage of larger size. The stimulus to the capture and sale of the terrapin, which is as yet rather feeble, comes from a demand in eastern cities, such as Philadelphia and Baltimore, where the diamond-back has been long known and esteemed and where the transition to other terrapin is easy. Along the Mississippi one man, an old fisherman who had at one time been a restaurant proprietor and famous for his cookery, said that they were most excellent eating. One of the fish dealers on the Illinois River said that terrapin is as good as the soft-shell, and each when fried is superior to chicken similarly prepared. In the Chicago market, unlike the snapper, which is sold by the pound, the terrapin are quoted by the individual or by the dozen. At one market they were quoted at from 25 to 30 cents apiece, and a fair sample weighed 2 pounds

and 11 ounces. Another dealer quoted them at 75 cents to $3 per dozen.

Along the Illinois River a little more was learned about the terrapin market. No actual fishing was in progress, but a turtle buyer from Philadelphia had visited the various fish markets and had distributed some information about its pecularities and market requirements. He stated that the terrapin were used as a substitute, or partial substitute, for diamond-back, and that for this purpose the males were not desired. What was wanted was the egg-bearing or "queen" terrapin. (At the Washington market in the autumn of 1917, when the first western—Le Sueur's—terrapin were coming on the market, it was learned that one of the "egg terrapin" was mixed with several diamond-back to make "diamond-back soup.") The river fishermen were unable to distinguish the sexes; but the Philadelphia buyer could do so, and readily picked out the "queens" from a lot of terrapin at hand, discarding the rest. During the summer of 1918 "queen" terrapin were being quoted at that place at $1 each. At St. Louis, in October, is was learned that the market men there distinguished the female of at least *Pseudemys elegans* by its much longer claws. There was no opportunity to verify this by dissection; but some of the turtles—a numerically small proportion of those at hand—had much longer and sharper claws than the others, and there was no marked intergradation in this respect. This may be a correlation with their habit of digging for the purpose of laying their eggs. The long-clawed terrapin, assumed to be females, also generally exhibited a different marking on the under side of the plastron. Late in the autumn (1918) a barrel of elegant terrapin, a few individuals of which possessed exceedingly long, sharp claws, was noted at Chicago.

Both at Chicago and St. Louis the market men reported that the only local buyers of terrapin were the Chinese, who are also buyers of the diamond-back shipped from the east. One of the proprietors of a fish market stated that the Chinese used the terrapin chiefly medicinally, "to clear the blood," and that by calling at a Chinese restaurant designated by him further information and a recipe could be secured. Upon visiting the place a very accommodating Chinese chef furnished the following information: "Turtles are good for internal troubles, for the blood, and especially for tuberculosis. They are cooked together with herbs imported from China and for which there is no English name. According to one recipe, the bones of the turtle are removed and the under part of the shell is boiled two or three hours with the skeleton of a duck. According to another, the meat is boiled in a double boiler with strong alcoholic wines, whisky, gin, etc." He added that he partakes of turtle in this manner only a few times in a year, when he feels in need of a tonic, stating that it makes him feel like a new man. Diamond-back terrapin was said to be the best turtle to use for this tonic, but, as it is very expensive, the hard-shell turtle, "Texas terrapin," is used as a substitute. Both from the remarkable similarity of the last given recipe to that of ordinary diamond-back-terrapin soup, and, from the statement of a native of China that the people of that country do not eat turtle, we are inclined to suspect that the use of terrapin is an American extension of the native bill of fare.

The most probable reason for the exceedingly limited use, one might almost say the nonuse, of the terrapin within the Mississippi Basin is the unfamiliarity with them. They rarely stray any distance from considerable bodies of water and are not often seen by the general population. To the frequenters of river and lake shores they are, however, the most commonly seen of turtles.

Other features that have prevented their coming into use are their relatively small size, 2 pounds being about the average, and the amount and hardness of shell, making the percentage of meat relatively small and difficult to get at. So long as there is a great abundance of other forms of game and fresh food the only reason for resorting to them would be the superior flavor of the flesh, and they would be sought after as luxuries rather than necessities. Their appeal would be to the taste rather than to the satisfaction of hunger. There is, of course, the deep-seated feeling that nothing common can be a luxury, as is indicated by the old contracts that servants should not be fed shad too frequently and by the fable about the farmer and crayfishes.

That the terrapin is of excellent flavor would appear from the testimony of those who have tried it and from the fact that it can be successfully substituted for the diamond-back. As a rule, it inhabits clean waters. The different species of terrapin differ in their food and feeding habits, and doubtless in their flavor, to a corresponding degree.

METHODS OF CAPTURE.

Because of their habits, the manner of the capture of the terrapin is entirely different from that of the snapper. They do not crowd together in hibernating places during the winter and can not, therefore, be taken in numbers during that season, as the snappers are. In the summer they are gregarious, crowding together in great numbers on projecting logs and banks. They can be easily taken in traps, a number and variety of which are known along the Illinois River. By simply sinking a box in a place full of snags and brush, a goodly number of terrapin will manage to drop in. A fish dealer reported that one man had a waterproof box sunk in water by weighting it with stones. He visited it daily, removing 30 to 40 turtles. Another form consisted simply of a box with an inclined board for a slide leading up to it. The turtles climbing up the slide to bask crowded the end ones into the box. A still more complicated form had the slide so placed on a pivot that if one or more turtles got beyond the pivot and overbalanced the lower end they were dumped into the box. The success with which an old sunken boat on a bar in Lake Maxinkuckee was observed to catch terrapin indicates the effectiveness of any of these devices. The gunwale of the boat would be crowded with the basking terrapin; and upon anyone's approach they would plump at once into the water, about half of them landing in the boat. The boys in the region, out of sport, caught 50 or 60 of the animals in one afternoon in this manner.

A method used in trapping the "slider," a species of terrapin in the southeastern part of the United States, doubtless would also prove efficacious. A projecting log is chosen and a heavily leaded

net placed entirely around it, except at the lower or entering end. The turtles climbing up on the log to bask keep pushing the foremost one off, and, if anyone approaches, all but one or a few at the lower or entering end of the log drop into the net. By this means great numbers can readily be taken.

SHIPMENT, STORAGE, AND MARKETING.

The shipment, storage, and marketing of the terrapin are the same as that of the snapper, except that, as has been said, practically all are sent to eastern markets. In the local markets they are sold by the individual or by the dozen instead of by weight.

THE SOFT-SHELL TURTLES.

Among the possible aquatic resources of the country an important place is occupied by the soft-shell turtles, of which there are two common species—the spiny, or common, soft-shell, *Amyda spinifera* (Le Sueur) (Pls. VII and VIII), and the smooth soft-shell, or leatherback, *Amyda mutica* (Le Sueur). These turtles are generally northern in their distribution. They are confined chiefly to the larger streams and lakes and are therefore rather unfamiliar objects to the general population. They never stray far from the water's edge and are very timid in disposition, taking to the water with exceeding swiftness when alarmed, so that even those who spend a great deal of time along rivers and lakes rarely get a very good view of uncaptured specimens. They are gregarious, assembling in considerable numbers on banks and sand bars.

COMMERCIAL SIGNIFICANCE.

The soft-shell turtles are seldom found in the markets. None was seen in the Washington market nor in Chicago, where it was reported that "they could not be given away, much less sold." And yet, where well known, the soft-shell is regarded as the most delicious of turtles. It is, indeed, a species of soft-shell turtle which is reared in Japan, much as the diamond-back terrapin is beginning to be raised in this country.

One reason for the absence or rarity of soft-shell turtles on the market is that they are too little known at the great market centers and too well known at the place of capture. No general demand has been created, and no special efforts are made to capture them. Numbers are incidentally caught by various forms of fishermen's gear, such as set lines, seines, and hoop nets, especially baited "fiddler nets" (the nets used to catch channel catfish). These incidentally caught turtles are not usually allowed to get beyond the fisheman who catches them; they are consumed mostly in the immediate locality where caught. In the small towns along the Mississippi and Illinois Rivers they are the favorite food turtles. The snappers are shipped to market and the soft-shells consumed locally. The dealers attribute their absence from the markets to several reasons. They do not stand shipment as well as other turtles, being of a more delicate nature. They are flatter and not so meaty as the

snapper; so there is more waste. The soft-shells, therefore, rank with those "home-consumption" delicacies, the famous honey banana, the emerald-gem muskmelon, and the fall pippin apple, which are too good for the market place and can not retain their original flavor after passing through the hands of the middlemen. The fish dealer at one of the towns visited shipped out a barrel of snappers, but when visited later it was found that he had a goodly number of soft-shells on hand. "They do not get beyond me," he explained.

The soft-shells are prized, not only for soup, but for frying; and for this purpose the younger individuals, weighing from 1 to 1½ pounds, are preferred. In making soup the shell may either be used or discarded.

The soft-shell loves the clear water over sandy bottoms and prefers a good current. Its principal food, to judge from a few specimens examined, consists of crayfishes. Both its habits and habitat are therefore conducive to an excellent flavor of flesh.

METHODS OF CAPTURE.

On account of their habits, the soft-shells can not be taken in quantities by the methods used for either the snapper or terrapin. They are gregarious, like the terrapin, but, as a general thing, they do not seek elevated positions in basking, any good sand bar proving satisfactory. They would not drop in numbers into boxes, and they do not "mud up" in large numbers, as do the snappers during the winter. They are rather hard to get in an ordinary seine. During the summer of 1907 several hundred were seen basking on one of the sand bars of the upper Mississippi not far below St. Paul. The sand bar was surrounded by a long net, with the expectation of bagging several barrels of turtles. These all took to the water and the net was drawn in. Only two turtles were obtained, the net having passed over the others, which had, no doubt, simply flattened down close to the bottom.

As previously stated, most of the soft-shells are captured incidentally on set lines or in hoop nets operated for fish. They can readily be caught in baited hoop nets, and one fisherman said that it was easier to get them, when desired, than it was to capture snappers. The nets must be visited at least every 12 hours, especially in warm weather, as the imprisoned turtles soon drown. Prof. Jacob Reighard in Ward and Whipple's "Fresh-water Biology," page 66, gives the following description of a turtle net:[a]

> Turtles are best taken in a turtle net, which is a form of fyke net. It should be of heavy twine and coarse mesh and, if it is desired to keep the turtles alive, should be modified as follows: The terminal section of the pot is made cylindrical or the whole pot may be made with square hoops. A circular opening is cut in the upper side of the terminal section of the pot and to this is attached the lower end of a cylinder of netting which extends to the water's surface. The upper end of this cylinder is attached to an opening cut in one side of a wooden box, provided on the opposite side with a hinged lid fastened with a hasp. The box is supported at the surface of the water on poles set in the bottom. When turtles reach the terminal section of the pot, they are able to

[a] Reighard, Jacob: Methods of collecting and photographing. Chap. III of Fresh-water Biology, by Henry B. Ward and George C. Whipple. John Wiley & Sons, New York, 1918.

enter the box through the cylinder of netting and are thereby saved from drowning, which would ensue if they could not reach the air. They may be removed through the lid at the convenience of the collector.

SHIPMENT.

In the upper Mississippi and in some of the glacial lakes in the northern part of our country the soft-shell is exceedingly abundant and if made use of would offer a considerable amount of meat to the inhabitants of those regions. The market men say that it can be beheaded and rough cleaned—that is, with just the viscera removed—and shipped on ice. In this condition it keeps as well as fish similarly treated. Frozen, they say, it remains in perfect condition and is as good when thawed as when fresh. Handled in this manner, it could, if there were a sufficient demand, furnish a considerable meat supply to a large area.

Taking the country at large, the turtles are much more scarce than formerly. From along the upper Illinois River comes the complaint that the turtles, especially appreciated there, are "becoming very scarce" or "practically exterminated" and that the local market demand is greater than the supply. This exhaustion is attributed to the draining of the feeding areas of the turtles and the building of levees. The State law of Illinois protects both turtles and terrapin of any size under a 7-inch shell. All that has saved the turtle to this day is probably the fact that it has remained more or less unappreciated.

ENEMIES OF TURTLES.

In spite of the various means with which nature has endowed the turtles for their welfare—the protecting shell of all of them; the timid disposition of the terrapin, which prevents them from wandering afar from safety and causes them to drop into the water at the first sign of alarm; the inconspicuous colors of most of them; the timidity and swiftness of the soft-shells; and the longevity of such as have passed the vicissitudes of early life—they are subject to many dangers and, on the whole, seem to be scarcely holding their own. A good many young appear to perish during the first winter. Musk-rats kill a few of the smaller species, but do not appear to molest those of larger size. Leeches often accumulate on turtles in considerable numbers, and, though they may never directly kill them, they doubtless greatly lessen their vitality. In the Japanese breeding establishments old turtles devour their young, and this may occasionally happen in nature. Doubtless carnivorous animals often dig up the nests and devour the eggs, as one often finds eggs scattered about and evidence of digging where the turtles make their nests.

By far one of the most important enemies is man. Fishermen finding turtles in their nets or on hooks often kill and discard them, instead of either releasing or using them. Many persons make it a practice to rob turtle nests by the wholesale, either for so-called sport or to use their eggs for fish bait. By digging into the sand bars used for nesting places hundreds of eggs can be taken and destroyed in a short time. Many turtles, especially soft-shells, are drowned in hoop nets used by fishermen.

PREPARATION OF TURTLES FOR THE TABLE.

KILLING THE TURTLE.

Notwithstanding the formidable appearance offered by the shell, the killing and dressing of turtles is a comparatively easy matter, and the men at the fish markets soon become expert at it and can kill and clean them with surprising rapidity. The first step is to get the animal to protrude its head. In the case of the snapper, this is easily accomplished by presenting to its head a stick of suitable size for the reptile to snap. It takes tenacious hold, and the head can readily be pulled out. The heads of the other species may be made to protrude by applying pressure, as with the foot, to the back or upper part of the shell. After the neck is well stretched out the turtle can readily be decapitated. At fish markets, where many turtles are dressed, the cleaners usually have a killing plank with a sharpened spike driven through at an angle, and the spike is thrust through the chin during the process of stretching.

Once beheaded, a sharp knife is run around the edges of the skin where it joins the shell and the skin pulled back over the legs to the feet, which are then disjointed. The lower part of the shell or plastron is then removed by cutting through the bridges which join the upper and lower shells, cutting close to the lower part of the shell. With snappers and soft-shells, in which the bridges are rather soft and cartilaginous, this can be done with a sharp knife. With the terrapin the bridge may be cut with a hatchet or saw. Having cut the bridges, the plastron or under shell may be readily removed by inserting a sharp knife just under it and lifting it off. This done, the entrails may be extracted with very little trouble, and the four quarters easily taken out from the carapace or upper shell. If one wishes to save the tenderloin in the upper part or "ceiling" of the carapace, the ribs may be cut with a hatchet. To the reader this may appear to be a lengthy and complicated process; but, as stated above, it is a simpler process than killing, plucking, and dressing a chicken.

A visit to a place where turtles are being dressed by professionals would prove very instructive. It need hardly be said that each has his own method as regards the smaller details. Some cut off the feet before skinning; others skin down to the feet and then disjoint. Some even cut off the feet before decapitation, but this is unnecessarily cruel. The smaller turtles and terrapin are often killed by dropping the living animal into boiling water just as lobsters and crayfishes are killed. This is a convenient method and not especially cruel, as death is practically instantaneous. With a large kettle the same method might be used for the soft-shell and snapper.

RECIPES.

Doubtless one reason for the general nonuse of turtles for food is the lack of knowledge as to just how to prepare them for the table and the lack of experience with turtles properly cooked. To meet this deficiency, the following recipes, which have been obtained from various available sources, are offered. A few have been gleaned from cookbooks, but most of them have been procured from per-

sons noted locally for their preparation of turtles. Special thanks are due to Henry Lemm, of Pekin, Ill., and to Mrs. Saunders, of the Saunders Fish Market, St. Louis, Mo., for choice recipes.

SOUPS.

These recipes apply especially to the snapper, which is the great soup turtle of the Mississippi Basin. They could, doubtless, be applied to terrapin and soft-shell also, as they are as good for soups as the snapper.

In making soups, cook the turtle only until the bones leave the flesh. Many cook too long, which makes the flesh stringy.

1. *Turtle soup.*—A favorite way to cook snapper is to make the soup like old-fashioned beef soup, with any assortment of vegetables desired, with the turtle meat cut up into small pieces.

2. *Turtle soup*—Make up a soup stock, without vegetables, but add egg.

3. *Turtle chowder.*—One-half pound turtle meat, 2 medium-sized potatoes, 3 onions, 3 carrots, any other vegetables wanted, as parsley, all diced into the pot; add ¼ pound of salt pork diced, 1 teaspoonful pepper, 1 level teaspoonful of butter, and cook about 2 hours over a slow fire. This is fine, a regular turtle chowder. With soft-shell turtle cut up the shell also, and cook for 4 hours.

4. *Soft-shell turtle soup.*—Use turtle meat same as for beef soup, adding a slice of bacon and onion to modify the flavor. (Soft-shell turtle meat is also good with noodles.)

5. *Turtle soup à la creole.*—This is the ancient recipe for turtle soup, and it is safe to say that when once eaten after this delightful way no other will seem quite so savory. Cut the turtle meat into small pieces. Let it brown in a pot with a little lard, cut up several onions, a slice of ham, and a little garlic, and stir and mix with the turtle meat. Then let the mixture brown well. Put in some flour and mix, pour a quantity of the soup stock into the pot, let it cool, and add a knee joint of veal. Let it simmer for an hour, then put in some thyme, laurel leaf, parsley, shallots, and when everything is cooked add more parsley and a couple of slices of lemon chopped fine. Just before serving add a wineglassful of Madeira wine, or, in lieu of this, ⅔ that amount of lemon juice.

6. *Terrapin soup.*—Use the meat and eggs from 1 terrapin, put into a stewpan with 2 tablespoonfuls of butter, and let it simmer until quite hot throughout, keeping the pan closely covered. Serve with the following sauce: 1 beaten egg yolk flavored with nutmeg and mace, ½ cup currant jelly, 1 pinch of cayenne, salt to taste, 1 tablespoonful of butter.

FRIED TURTLE.

Although the turtles generally preferred for frying are medium-sized soft-shells weighing from 1½ to 3 pounds, many like fried snapper. For frying, the younger and more tender snappers are to be preferred, although the older ones can be used by cooking correspondingly longer.

7. *Fried turtle.*—Cut the turtle meat into small pieces, add salt and pepper, roll in flour, and fry in one-half lard and one-half butter until brown, then add a little water, cover up, and steam until done (about ½ hour).

8. *Fried turtle.*—Fry as above; when browned add some catsup, a few mixed spices, a glass of wine, or, in lieu of this, 2 tablespoonfuls of vinegar and a little water; cover, and steam until done (about ½ hour).

9. *Fried turtle.*—Some cooks prefer to fry dry, without steam; in this case one must cook slowly, and of course old turtles must be cooked longer than young ones.

10. *Fried turtle.*—Simply parboil the turtle meat and fry in butter.

11. *Fried turtle.*—Put the turtle meat into salt water for a short time, remove and wipe dry, sprinkle with corn meal, and fry in hot grease, or use butter, salt, and pepper, and thicken with barley. (The person who furnished this recipe generally preferred snapper to other turtles, and had this species in mind.)

12. *Fried snapper.*—Put the turtle meat into salt water overnight, take out, wipe dry, sprinkle with flour, and fry in plenty of grease. Fry slowly until brown. This is said to be better than fried chicken. For this old turtles are said to be as good as young.

MISCELLANEOUS.

The following recipes were obtained at St. Louis and apply to the native turtles used there. They were meant to apply especially to the snapper; it is believed, however, that they could be applied to the more delicate soft-shell, where procurable, with even better results.

13. *Steamed turtle.*—Take fresh turtle meat, fill with black pepper and a bit of butter, steam until the flesh separates from the bones, then add black sauce (the soy-bean sauce to be found in Chinese restaurants) or Worcestershire sauce.

14. *Turtle cutlet.*—Take lean turtle meat, pound until like hamburger steak, dip into egg, roll in meal, and fry in hot fat. This tastes like veal cutlet.

15. *Simmered turtle.*—Take 1 pound turtle meat, wash, cut into cubes, brown in fat (lard or butter) with 1 large or 2 medium-sized onions, simmer until tender, add Chili pepper while simmering. To serve, pour over boiled rice.

16. *Curry of turtle.*—Take 1 pound of turtle meat, brown as above, with 1 large or 2 medium-sized onions. Put into the pot 1 medium-sized potato, 1 carrot, the onions which have been cooked with the turtle, a small piece of parsley, ½ teaspoonful of pepper, 1 teaspoonful of salt, and ½ teaspoonful of curry powder. Add the browned turtle meat to the mixture in the pot and let simmer until tender. Make molds by hollowing out cups of boiled rice and serve in the molds. This tastes like curry of chicken or curry of veal.

17. *Turtle rivola.*—(*a*) One-half pound turtle meat, best chopped through a food chopper, add 2 onions, cook until tender, add ¼ pound of cheese and salt and pepper.

(*b*) Take 1 cup flour, 1 egg, ¼ teaspoonful salt, make a thick batter, roll out thin into a sheet of noodle dough, and cut into 2-inch dice.

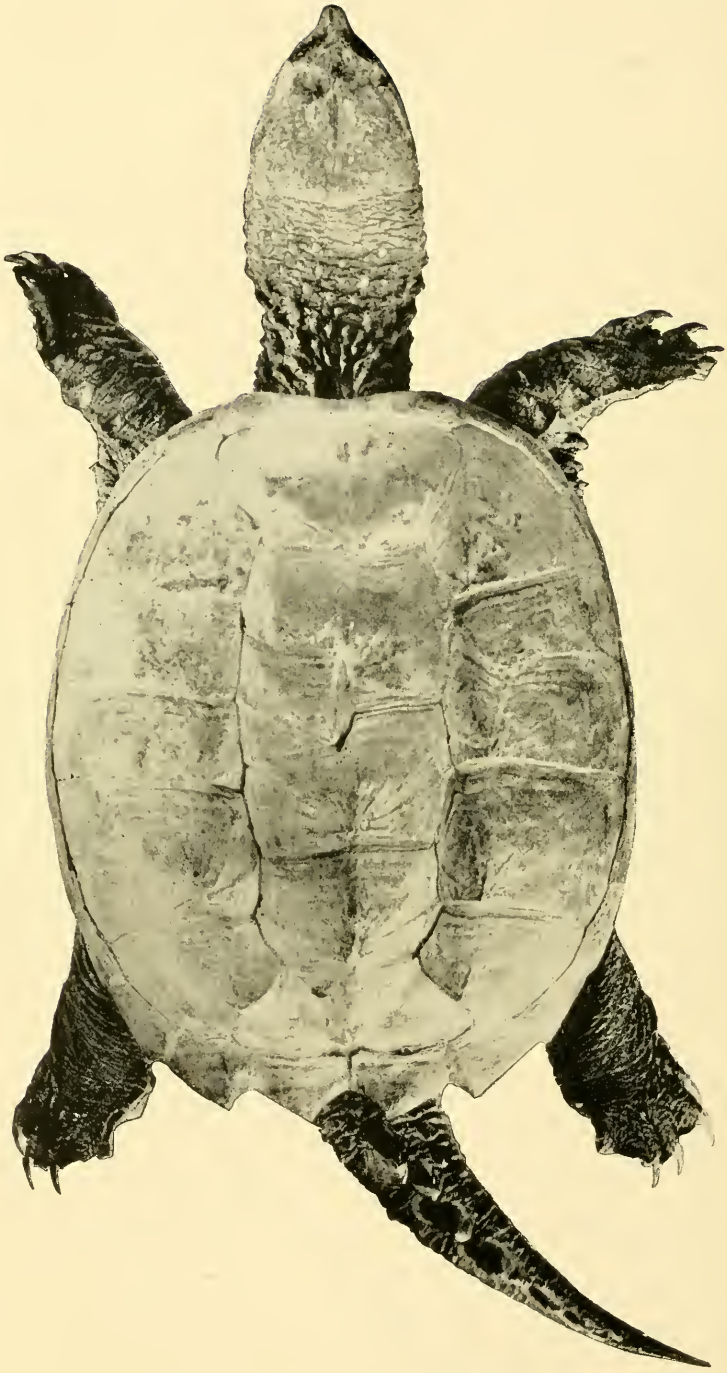
(*c*) Take 1 spoonful of minced turtle meat, lay on the diced noodle dough, fold over 3 corners and inclose the meat, cook like noodles in the water that the turtle meat was cooked in, to which a spoonful of butter has been added.

18. *Turtle sausage.*—Cook 2 pounds of turtle meat until tender, run through a food chopper, add 2 eggs, drop into hot fat or fry right off the spoon until brown.

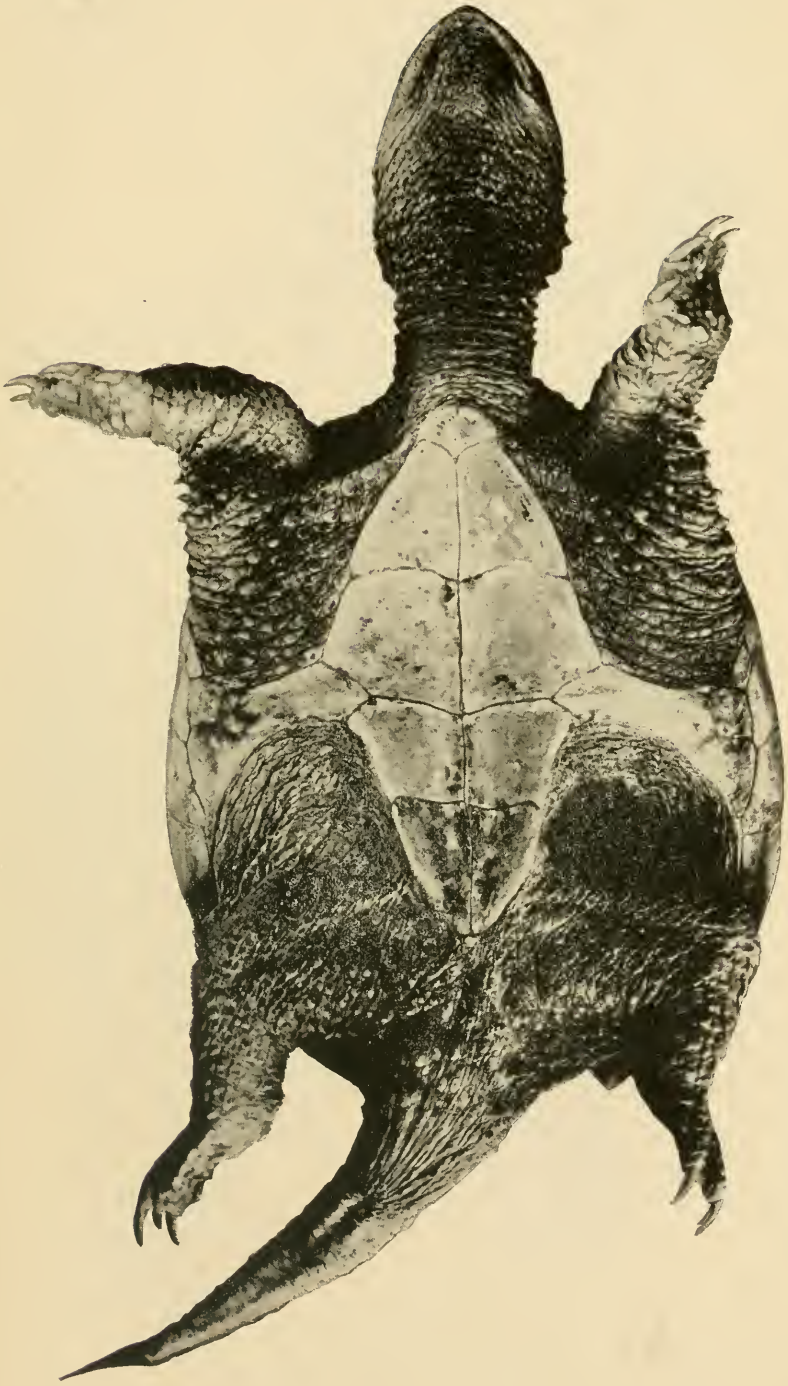
While the following recipe was originally intended to apply to the diamond-back terrapin, it would doubtless serve very well for the fresh-water species, and possibly for snapper or soft-shell turtle also:

19. *Stewed terrapin with cream.*[a]—Place in a saucepan 2 tablespoonfuls of butter and 1 of rice flour, stir over a fire until it bubbles, then stir in a pint of thin cream, 1 tablespoonful salt, ½ tablespoonful white pepper, ¼ tablespoonful grated nutmeg, and a very small pinch of cayenne, next put in 1 pint of terrapin meat, and stir it all until scalding hot. Move saucepan to back part of stove, where contents will keep hot, but not boil, then stir in 4 well-beaten yolks of eggs. Do not boil, but pour immediately into tureen containing 1 tablespoonful lemon juice. Serve hot.

[a] From the "White House Cook Book."

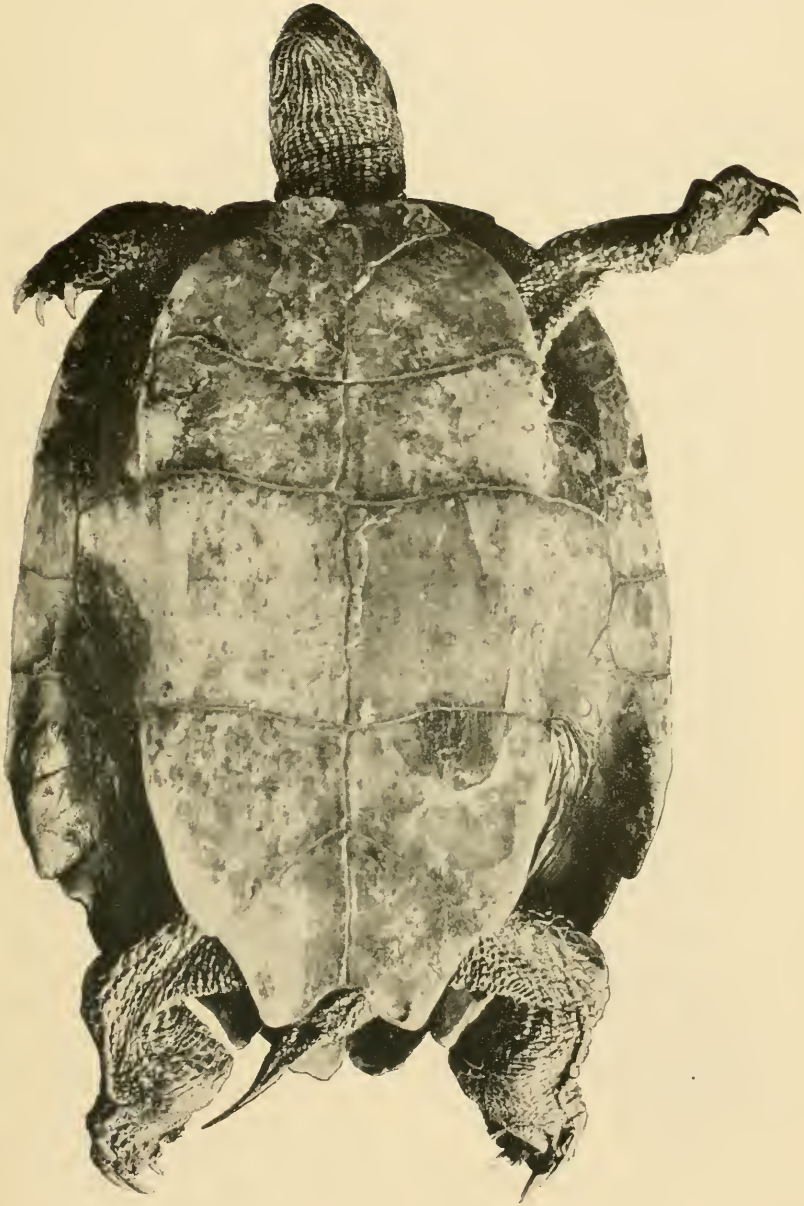


SNAPPING TURTLE, CHELYDRA SERPENTINA (LINNAEUS).



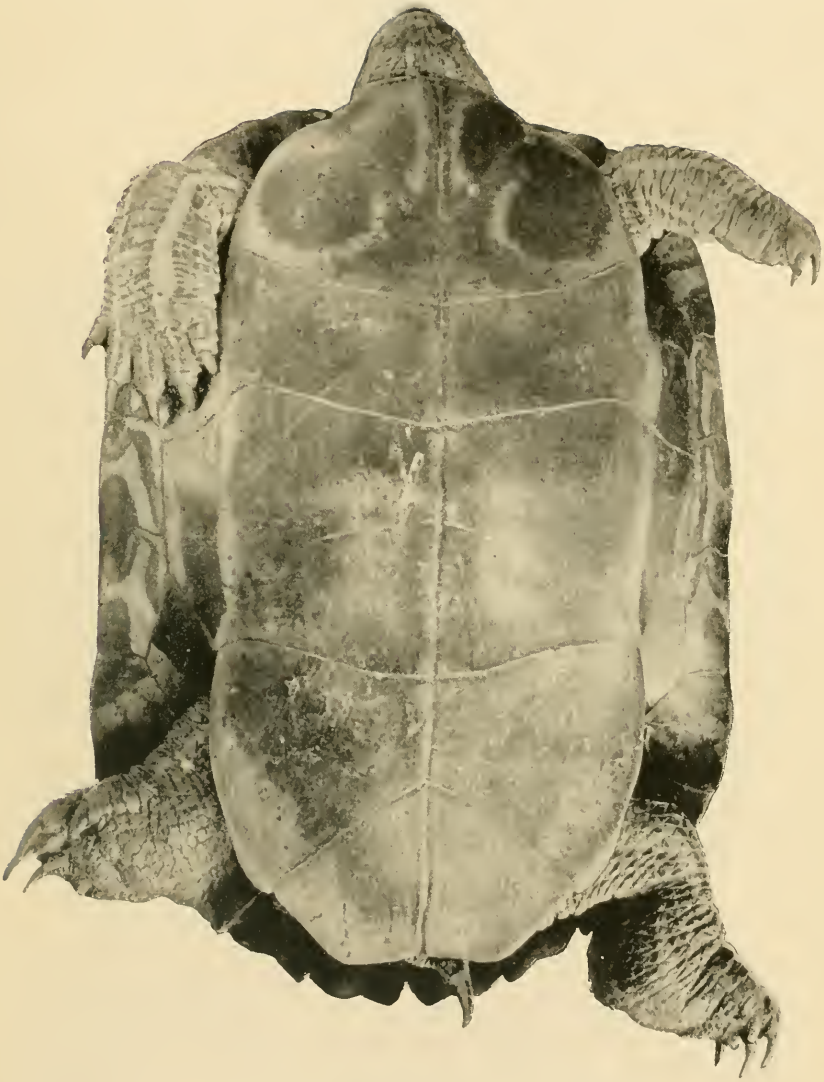
SNAPPING TURTLE, CHELYDRA SERPENTINA (LINNAEUS).

LE SUEUR TERRAPIN, GRAPTEMYS LESUEURII.

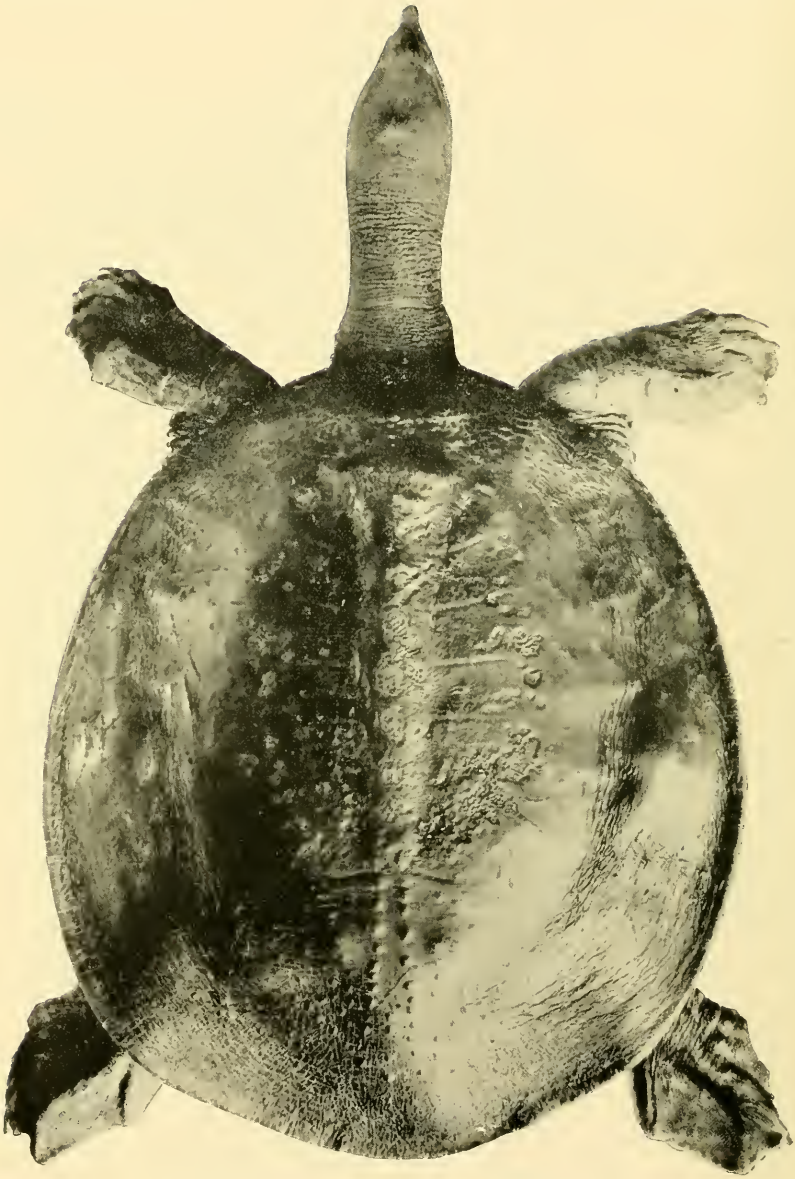


LE SUEUR TERRAPIN, GRAPTEMYS LESUEURII.

ELEGANT TERRAPIN, PSEUDEMYS ELEGANS.



ELEGANT TERRAPIN, PSEUDEMYS ELEGANS.



SOFT-SHELL TURTLE, AMYDA SPINIFERA.

SOFT-SHELL TURTLE, AMYDA SPINIFERA.